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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

60308US0

U.S. APPLICATION NO. (If known, see 37 CFR 1.5

09/830017  
FILED HEREIN

INTERNATIONAL APPLICATION NO.

PCT/DE99/03389

INTERNATIONAL FILING DATE

21 October 1999

PRIORITY DATE CLAIMED

22 October 1998

TITLE OF INVENTION

METHOD FOR PRODUCING ELECTRICAL ENERGY

APPLICANT(S) FOR DO/EO/US

Alexander Luchinskiy, Gunther Werth and Yakov Shifrin

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

## Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

[illegible]

### Method for producing electrical energy

A process is known for generating high DC voltages by mechanical displacement of electrical charges. In doing so the charges between two working media are separated by triboelectrification or by induced electrization, one of the two media being electrically connected to an electrode.

Accordingly the second working medium is transferred to another electrode on which the charge is picked up. The described process is carried out in devices which are called electrostatic generators (DE 23 36 487 A1, European Patent Application 0229 843 A1).

A process is known for producing electrical energy by friction of certain stiff dielectric surfaces consisting of different materials against one another, and it is accomplished in a compact device (European Patent Application 0366591 A1).

The cited devices which accomplish the known processes are characterized by the possibility of generating electrical high voltage (up to 15-20 MV), by a low current (up to 10 mA), therefore also by low power. The power of these devices is limited on the one hand by the maximum allowable surface density of charges on a conveyor, the carrier of the charge, on the one hand, and by the speed of mechanical movement of this charge conveyor.

The charge density for its part is limited by the formation of an electrical discharge on the surface. The speed of the charge conveyor is limited by the mechanical motion possibilities of the system parts.

The efficiency of the system is determined mainly by the aerodynamic losses as the charge conveyor is moved mechanically and by the friction of the mechanical system parts among one another. In existing devices this is not greater than 15-20%.

The object of the invention which is given in claims 1-6 is to increase the power and the efficiency of the devices which implement the described process and to enable conversion of the thermal energy into electrical energy.

This object is achieved by the features listed in claims 1-5.

The advantages which are achieved with the invention consist especially in that the indicated process enables use of thermal energy of any heater for its direct conversion into electrical energy, high output power and high efficiency being achieved.

As a result of the properties of the heat tubes, a relatively small temperature difference between the heater and cooler is sufficient to achieve a high flow velocity of the gaseous working medium of the heat tubes and consequently also high kinetic energy. By means of this kinetic energy the indicated flow causes triboelectrification of the working media of the electrostatic generator and mechanical separation of charges. In the devices which implement this process thus there are no mechanically moving parts, for which reason all losses of power and efficiency which occur for this reason are prevented. Moreover, in this case drive does not take place by external mechanical work, but by thermal energy which can even be removed from a small temperature difference.

The embodiments of the process are shown in the drawings and are detailed below.

Figure 1 shows an embodiment of the process in a fixed device with its indicated orientation in the gravitational field.

Figure 2 shows an embodiment of the process in a device which can function at different orientations, in a gravitational field, and also in weightlessness.

Figure 3 shows an embodiment of the process in which the working liquid of the electrostatic generator is not electrified at the site of its detachment from the mouth of the feeder

nozzle, but at some distance from it by the breakdown of the droplets when they suddenly encounter the grid.

All types of devices which enable the process contain a heat tube (WR) 1 and a generator 2. The heat tube 1 has the working medium in the liquid phase (the working liquid of the heat tube) 3 and in the gaseous phase (the working gas of the heat tube) 4, and a capillary insert of the heat tube 5. The generator 2 contains the solid working medium of the generator 6, the liquid working medium of the generator 7, the grid for charge pick-up 8, the external electrodes 9a and 9b and the loop 10 for return of the liquid working medium.

When an external temperature gradient builds up between the vaporizer 11 and the condenser of the heat tube 12 the working liquid of the heat tube vaporizes in the vaporizer on its capillary structure. At the same time the working gas of the heat tube condenses on the capillary structure of the condenser of the heat tube. The liquid 3 travels via the capillary insert 5 out of the condenser back into the vaporizer.

It is sufficient for the continuation of the process that the latent heat of vaporization in the former case is supplied to the working medium of the heat tube and in the latter case is removed. Therefore this process can also be carried out at a very small temperature difference.

Here the volume of the working medium of the heat tube in the vaporizer increases suddenly and as a result the pressure of the working gas 4 in the vaporizer does likewise. The volume of the working medium and the pressure of the working gas of the heat tube in the condenser decrease equally suddenly.

Thus, at a small temperature difference in a closed space two processes of increase and decrease of the gas pressure take place simultaneously and uninterruptedly in a closed space; these processes are distributed in space, proceed with different signs, and are explosive according to properties. This leads to formation of a high speed gas flow from the vaporizer into the condenser.

In doing so the thermal energy which is supplied to the heat tube is converted into kinetic energy of the molecules of the gas flow and can be converted further into other types of energy, for example, into electrical energy.

The solid working medium 6 and the liquid working medium 7 of the generator 2 are accommodated within the heat tube, roughly at the location of the maximum flow of the working gas of the heat tube 4, directly behind the diaphragm 13. The diaphragm 13 concentrates the gas flow from the vaporizer into the condenser. In doing so the solid working medium 6 is attached stationary with respect to the heat tube.

The liquid working medium 7 is supplied to the interior of the heat tube via the feeder 14, charge separation and charge displacement taking place using the directed gas flow of the heat tube, which flow entrains liquid particles and routes them past the other working medium for charge separation and displacement.

Subsequently the charge is picked up on the external electrode 9a, quite analogously to the manner in which this takes place in electrostatic generators with solid media.

In one version of process execution (Figure 2) the loop 10 for return of the liquid working medium 7 of the generator is filled with the capillary structure. This makes it possible for the device to work regardless of its location in the gravitational field, and also in weightlessness. Here the open surface of the aforementioned capillary structure is housed directly behind the grid of the pick-up electrode 8.

In the embodiments of other versions of the process (Figure 3) charge separation takes place by the liquid 7 striking the medium 6. Here the medium 6 has the shape of for example a grid. In this case the solid working medium is moved at some distance l from the insertion site of the feeder 14 into the interior of the heat tube. The droplets of the medium 7 before striking the medium 6 acquire a certain kinetic energy which is expended for charge separation. After impact the charged droplets are carried on further with the gas flow of the heat tube 4 to the electrode 8.

The gases which are not condensing and which remain in the heat tube (for example air and also vapors of the working liquid of the generator which in a closed space are inevitably joined to the liquid which has a free surface) are pushed away by the working gas of the heat tube to one of the ends of the tube in the first seconds of operation of the heat tube, and form a gas cushion 15.

In the geometry of the heat tube and the electrode for the charge pick-up 8 (Figures 1-3) this gas cushion to a certain extent thermally insulates the pick-up electrode 8 and the wall of the heat tube adjoining it. Therefore the temperature of the electrode generally differs from the temperature of the capillary structure of the condenser of the heat tube.

Since the insertion site of the feeder 14 into the heat tube is outside of the vaporizer, the same liquid can be used as the working liquid of the heat tube and of the generator.

## CLAIMS

1. Process for producing electrical energy, in which the charges between two working media are separated triboelectrically or electrostatically, the charges are moved away from one another by displacement of the working media under the action of external forces, the external forces performing work against the Coulomb force, and the charges being guided onto electrodes,

wherein

the indicated process steps are carried out within the inside volume of a heat tube, charge separation and charge displacement taking place using the directed gas flow of the heat tube, which flow entrains one working medium and routes it past the other working medium for charge separation and displacement.

2. Process as claimed in claim 1, wherein one working medium encompasses liquid particles which are entrained in the gas flow.

3. Process as claimed in claim 1 or 2, wherein one working medium comprises a grid through which the gas flow passes.

4. Process as claimed in one of claims 1 to 3, wherein the other working medium is located within the heat tube roughly at the position of maximum flow velocity.

5. Process as claimed in one of claims 2 to 4, wherein the liquid is recovered to form the liquid particles.

6. Process as claimed in one of claims 1 to 5, wherein the same liquid is used for the working liquid of the heat tube and of the generator.



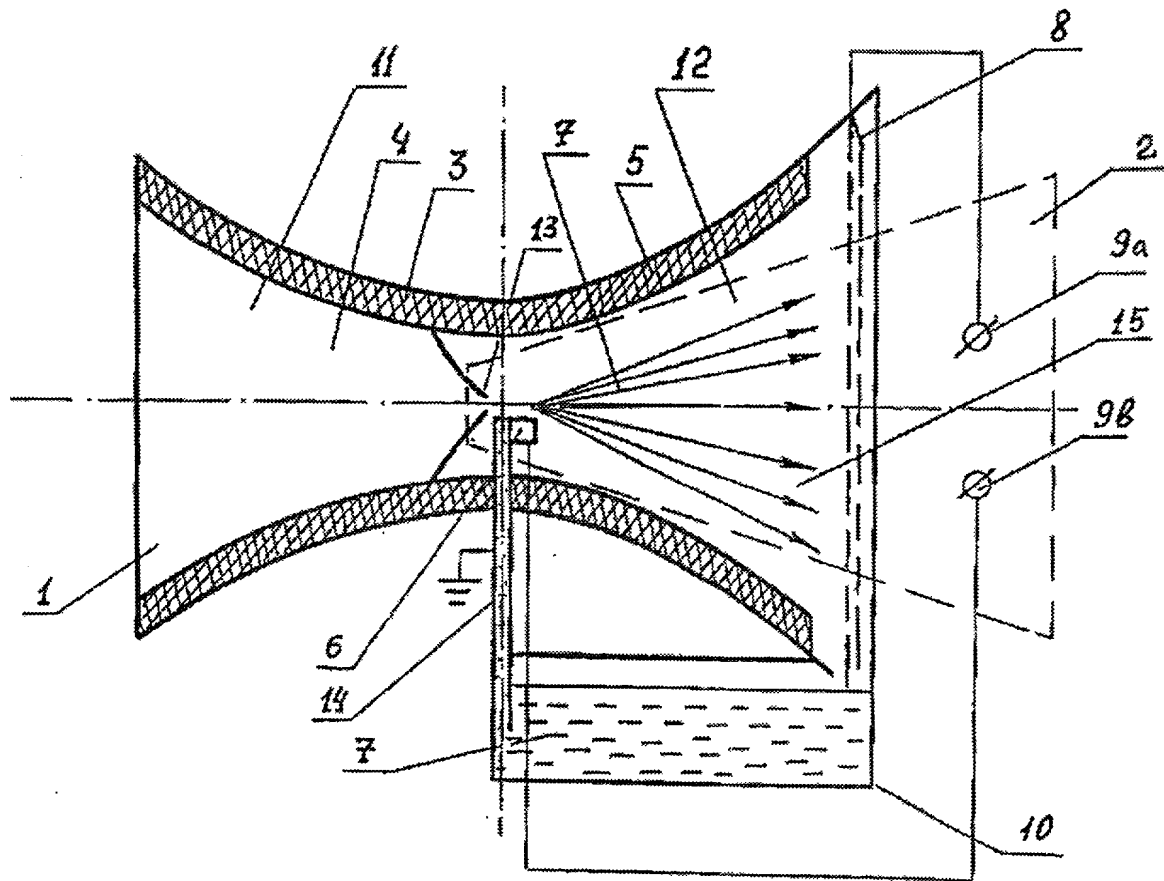
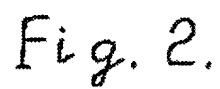


Fig. 1.



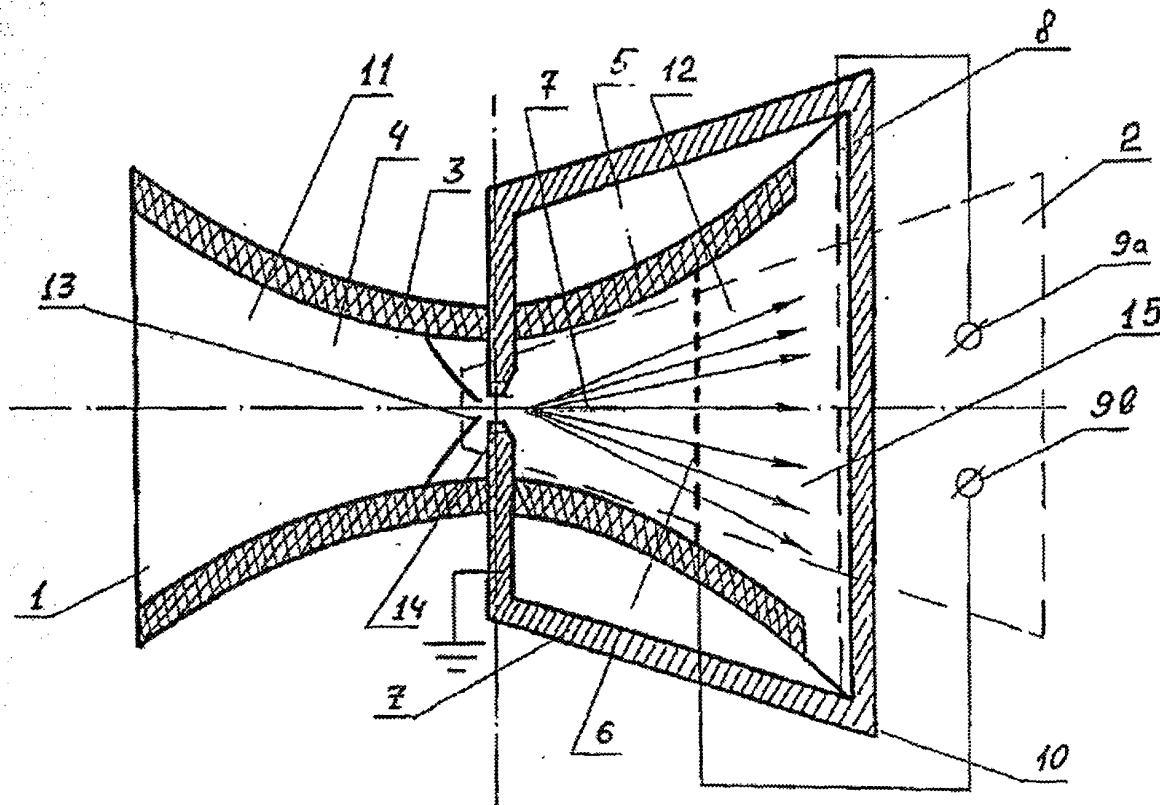


Fig. 3.

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PTO/SB/01 (03-01)

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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# DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number

First Named Inventor

Luchinskiy

## COMPLETE IF KNOWN

Application Number

09 / 830,017

Filing Date

Group Art Unit

Examiner Name

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD FOR PRODUCING ELECTRICAL ENERGY

(Title of the invention)

the specification of which

☐ is incorporated herein☒ was filed on (MM/DD/YYYY) 21.10.1999 as United States Application Number or PCT International

Application Number PCT/DE99/03389 and was amended on (MM/DD/YYYY) 08.11.2000 (if applicable).

(Explanation to amendments s. Enclosure)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.


I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
PCT/DE 99/03389	PCT	21.10.1999	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DE 198 48 52.1	Germany (DE)	22.10.1998	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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**DECLARATION****ADDITIONAL INVENTOR(S)**

Supplemental Sheet

Page 1 of 1

Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
3 - 00 <u>ukr</u> <u>Solomonovich</u>		<u>Shifrin</u>					
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Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
Inventor's Signature						Date	
Residence: City		State		Country		Citizenship	
Post Office Address							
Post Office Address							
City		State		ZIP		Country	
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
Inventor's Signature						Date	
Residence: City		State		Country		Citizenship	
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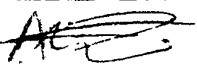

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**DECLARATION — Utility or Design Patent Application**

Direct correspondence to: <input checked="" type="checkbox"/> Customer Number <span style="border: 1px solid black; padding: 2px 20px;"></span> OR <input checked="" type="checkbox"/> Correspondence address below	
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Country <u>Germany</u>	Telephone <u>+49 (671) 35594</u> Fax <u>+49 671 35594</u>
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.	
NAME OF SOLE OR FIRST INVENTOR: <input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name <u>Alexander</u> (first and middle (if any))	Family Name <u>Luchinskiy</u> or Surname
Inventor Signature 	Date <u>19.07.01</u>
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Inventor Signature 	Date <u>19.7.01</u>
Residence City <u>Mainz</u> DEX	State <u>—</u> Country <u>Germany</u> Citizenship <u>German</u>
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City <u>Mainz</u>	State <u>—</u> ZIP <u>D-55127</u> Country <u>Germany</u>
<input checked="" type="checkbox"/> Additional inventors are being named on the <u>1</u> supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto	

[Page 2 of 2]

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